



Connecting Two Modbus Masters to an NXF4000 or PPC4000

September 9, 2020

Both the NXF4000 and PPC4000 offer a single Modbus RTU slave port for use with a BMS, PLC or SCADA system. This interface offers read/write capability and can be essential when integrating the control into the supervisory system.

When using one of the enhanced touchscreens (NXTSD507HD and NXTSD512HD), this interface is not available for external use since the displays use the same interface. Fortunately, both offer a Modbus TCP/IP server as an alternative, which offers much faster connectivity. If Modbus TCP/IP can't be used, there is a method that can be used to connect both the touchscreen and supervisory system to the NXF4000 or PPC4000 simultaneously, using a third-party device.

DEVICE

The device to use is the **tSH-735** from ICP DAS. The website for this product is https://www.icpdas-usa.com/tsh_735. The device is DIN-rail mountable and can get power from the NXF4000 or PPC4000.

With configuration, this device allows two Modbus RTU master devices to connect to a single Modbus RTU slave device. The tSH-735 manages the traffic which means that each device can have different communication settings if desired (baud rate, parity, etc.).

WIRING

The tSH-735 accepts 12-48VDC power and comes with a barrel connector incorporating flying leads for connection to the 24VDC power available from the NXF4000 or PPC4000. Connect the red wire to P2.1 and the black wire to P2.4, 2.5 or 2.6.

There are three RS-485 serial ports available on the tSH-735. The application shown here will use port 2 to connect to the NXF4000 or PPC4000. Port 1 is used for the touchscreen and port 3 is used for the supervisory system.

	tSH-735	NXF4000/PPC4000
Port 2	D2+	P12.1
	D2-	P12.2
	tSH-735	NXTSD5xxHD
Port 1	D1+	COM1+
	D1-	COM1-
	tSH-735	BMS/PLC/SCADA*
Port 3	D3+	A, A+, D+, +
	D3-	B, B-, D-, -

*terminology will vary for Modbus connections



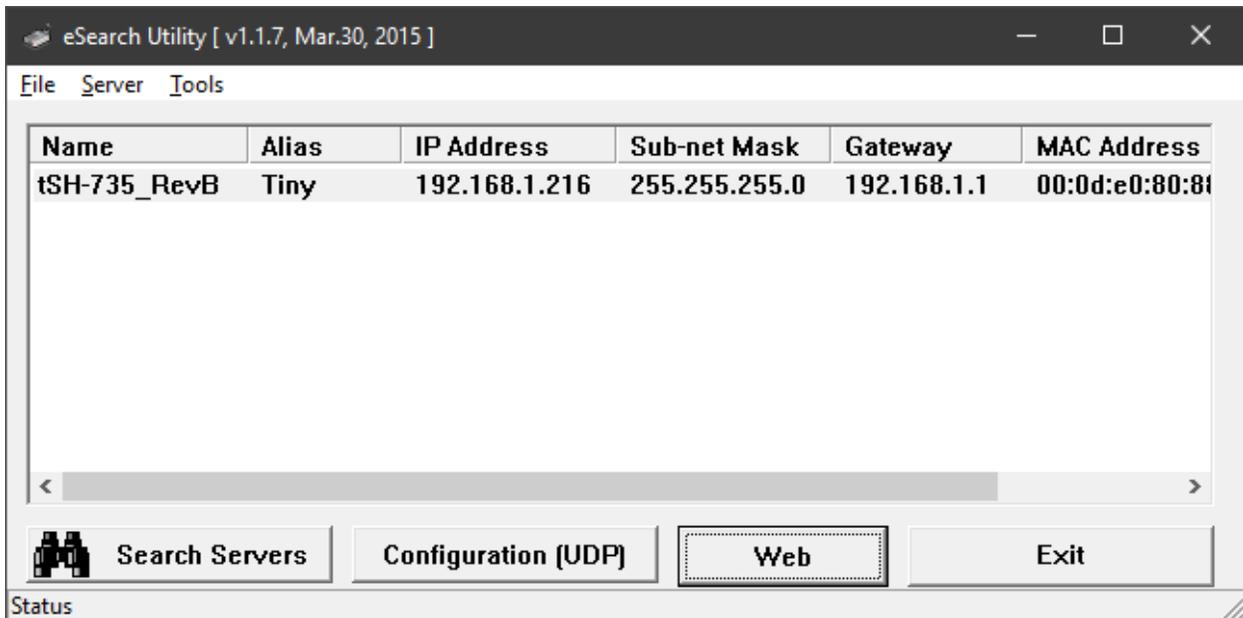


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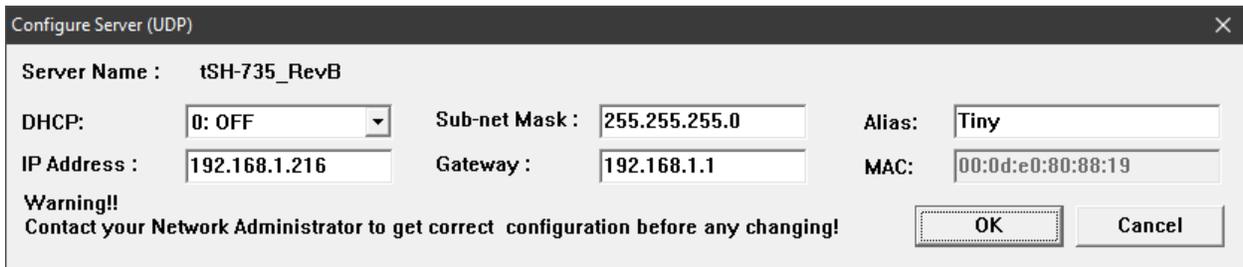
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CONFIGURATION

Some configuration is required for the tSH-735. Configuration is done using an Ethernet connection. With the tSH-735 powered, connect an Ethernet cable to a PC and run the *eSearch Utility* software (available from www.icpdas-usa.com). The IP address of the PC may have to be set to static in the same range as the tSH-735 – consult the product documentation for further clarification.



Click **Search Servers** to display any connected devices. Clicking **Configuration (UDP)** allows the IP address to be changed. It is recommended that DHCP is turned off and that a static IP address is used if possible.



Click **Web** to open the local web server for the tSH-735. This will be opened using the default web browser. The IP address can also be entered into the search bar for the





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web browser.

The web server will show the current configured status.



Tiny Serial Port Sharer (tSH-700 RevB)

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Model Name:	tSH-735_RevB	Alias Name:	Tiny
Firmware Version:	B1.4.3 [Aug 17 2016]	MAC Address:	00-04-e0-80-88-19
IP Address:	192.168.1.216	TCP Command Port:	10000
Initial Switch:	OFF	System Timeout (Network Watchdog, Seconds):	0

Current port settings:

Port Settings	Port 1	Port 2	Port 3
Baud Rate (bps)	57600	57600	57600
Data Size (bits)	8	8	8
Parity	None	None	None
Stop Bits (bits)	1	1	1
Connected Device	Master	Slave	Master
Protocol	Modbus RTU	Modbus RTU	Modbus RTU
Char. Timeout (bytes)	5	5	5
Port Watchdogs	Port 1	Port 2	Port 3
TX Idle (seconds)	0	0	0
RX Idle (seconds)	0	0	0

Application Settings:

Application Mode:	2 (Modbus Sharer - Half Duplex)
Port for Slave Device:	2
Slave Timeout (ms):	60
Read Cache (ms):	0
Modbus ID Range:	1 to 247

Click **Application Mode** in the top menu bar to change the required settings.

Application Mode Settings

Application Mode Port Setting Update

Mode 0: Serial Converter
 (1-to-1 full/half-duplex communication with raw data)

Mode 1: Serial Sharer
 (2-to-1 or 1-to-1 half-duplex communication with raw data)

Mode 2: Modbus Sharer
 (2-to-1 or 1-to-1 half-duplex communication with Modbus RTU/ASCII conversion)

PLC (9600, N81) → tSH-700 → Device (115200, R71)

HMI Master1 (DCON Protocol 115200 bps, RS-232/485) → tSH-700 → Raw Data Mode (115200 bps, RS-232/485) → M-7000 (1-7000) (Serial Remote I/O Module (Slave))

SCADA Master2 (Modbus RTU 9600 bps, RS-232/485) → tSH-700 → HMI Master2 (Modbus ASCII 97680 bps, RS-232/485) → M-7000 (Serial Remote I/O Module (Slave))

Slave Devices Connected on: Port 1 Port 2 Port 3
 Note: Most query-response protocols (like DCON, Modbus...) without conversion can be used.

Protocol: Port1: [RTU] Port2: [RTU] Port3: [RTU]

Slave Devices Connected on: Port1: Port2: Port3:

Slave Timeout (ms): 60 (60 to 65530 ms) **Refer to the note below.**

Read Cache (ms): 0 (10, 20... 65530, Disable: 0)

Virtual Modbus ID: 1 to 247 (Available ID range: 0 to 255)
 Note: Sharer will skip the Modbus messages when its ID is NOT in the specified range.

Modbus ID Offset: 0 (Offset = -255 to 255, No change = 0)
 For example:
 Virtual ID = 1 to 10, offset = 10, then physical Slave ID = 11 to 20
 Virtual ID = 31 to 40, offset = -10, then physical Slave ID = 21 to 30.

Make sure **Mode 2 Modbus Sharer** is chosen and that *Protocol* for each port is set for **RTU** and that the *Slave Devices Connected On* is set to **Port 2**. Set the *Slave Timeout (ms)* to **60** and the *Read Cache (ms)* to **0**. Set *Virtual Modbus ID* from **1** to **247** and *Modbus ID Offset* to **0**. Make sure to click **Submit** to apply changes.





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These changes are required to allow writes to process correctly. If left at the default settings, most reads should process normally but there may be errors when writing data. Even with these settings, there may be occasional communication errors, but these should not affect normal usage. If this occurs, adjusting the *Slave Timeout (ms)* and *Read Cache (ms)* parameters may help correct this.

The default port settings for the NXF4000 and PPC4000 are to use 57600 baud and node address 247. Use these settings for port 1 and port 2 so that the touchscreen can communicate as fast as possible with each other. Changing the address from 247 is not done with the tSH-735, this is done either at the NXF4000/PPC4000 or from the touchscreen.

The settings for port 3 (supervisory system) can use a different baud rate if desired. Click **Port 3** on the menu bar to display the port settings.

Port 3 Settings

Port Settings	Current	Updated
Baud Rate (bps)	57600	57600 bits/S
Data Size (bits)	8	8 bits/character
Parity	None	None
Stop Bits(bits)	1	1
CRC/LBC Confirm	YES	YES
Char Timeout (bytes)	5	5 (4 - 15, Default: 5)
Port Watchdogs	Current	Updated
TX Idle (seconds)	0	0 (20 - 65535, Disable: 0)
RX Idle (seconds)	0	0 (20 - 65535, Disable: 0)
<input type="button" value="Submit"/>		

If the port settings are changed, click **Submit** to apply the changes.

Once configured, no reboot is necessary and both Modbus RTU master devices should be able to read and write data to and from the NXF4000 or PPC4000.

